

MAC1140 Course Outline

Precalculus(3) (P)

Description: This course, in combination with MAC1114, will prepare students to take the calculus sequence MAC2311, MAC2312 and MAC2313. The course includes an in-depth study of functions; polynomial, rational, algebraic, piecewise, logarithmic, and exponential functions, including their properties, graphs, and applications; conic sections; nonlinear inequalities; binomial theorem; induction; matrices and determinants; and sequences and series.

General Education Learning Outcome: The primary General Education Learning Outcome (GELO) for this course is Quantitative Reasoning, which is to understand and apply mathematical concepts and reasoning, and analyze and interpret various types of data. The GELO will be assessed through targeted questions on either the comprehensive final or an outside assignment.

Prerequisite: MAC1105 with a grade of "C" or better, OR the equivalent.

Rationale: In an increasingly complex world, mathematical thinking, understanding, and skill are more important than ever. Many concepts will be introduced using real world data from various areas, and other concepts will be reinforced by applying them to problems in the areas of science, business, economics, and medicine.

Impact Assessment: *Precalculus Algebra* provides students with skills and proficiency in understanding the concepts needed for the calculus sequence, including an in-depth understanding of functions and their applications, and the opportunity to learn to communicate and reason mathematically. The course applies toward the General Education mathematics requirement area A for an Associate of Arts degree. MAC1140 is a prerequisite for MAC2311 and is required for many degrees in mathematics and the sciences.

Broad Course Objectives: This course supports the following goals of the Math Department.

- Engage students in sound mathematical thinking and reasoning. This should include students finding patterns, generalizing, and asking and answering relevant questions.
- Explore multiple representations of topics including graphical, symbolic, numerical, oral, and written. Encourage students to make connections between the various representations to gain a richer, more flexible understanding of each concept.
- Analyze the structure of real-world problems and plan solution strategies. Solve the problems using appropriate tools.
- Develop a mathematical vocabulary by expressing mathematical ideas orally and in writing.
- Provide a setting that prepares students to read and learn mathematics on their own.
- Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate.

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As a result of successfully completing MAC1140, students should be able to demonstrate the following:

- Analyze and interpret quantitative data verbally, graphically, symbolically and numerically.
- Communicate quantitative data verbally, graphically, symbolically and numerically.
- Appropriately integrate technology into mathematical processes.
- Use mathematical concepts in problem-solving through integration of new material and modeling.

Topical Outline with Specific Course Objectives:

- I. *Introduction of Functions, the Properties, Graphs, and Inverses*
 - A. Analyze and interpret functions using graphs, tables, and equations.
 - B. Determine domain and range both algebraically and graphically.
 - C. Construct the inverse of a function, both graphically and algebraically when feasible.
 - D. Demonstrate an intuitive understanding of functions including limits, continuity, increasing, decreasing, maximum and minimum values, and concavity.
- II. *Polynomial, Rational, Exponential, Logarithmic, and Piecewise-Defined Functions*
 - A. Model real-world applications using the functions.
 - B. Explain the relationship between logarithmic and exponential functions.
- III. *Polynomial and Rational Inequalities*
 - A. Solve non-linear inequalities numerically and graphically, as well as algebraically.
- IV. *Conic Sections*
 - A. Identify and graph a conic section from its equation.
 - B. Find the equation of a conic section from its description.
 - C. Identify the attributes of a conic section.
- V. *Coordinate Transformation*
 - A. Relate the algebra of functions to graphical representations.
- VI. *Required Special Topics*
 - A. Use matrices and determinants to solve linear systems of equations.
 - B. Demonstrate an understanding of Proof by Induction.
 - C. Apply the Binomial Theorem.
 - D. Recognize arithmetic and geometric sequences and series in summation or iterative notation.

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Evaluation: Each instructor will determine the specific criteria for determining the final course grade. These criteria will be delineated in the first day handout provided to each student. Each instructor will give a comprehensive final exam during the assigned final exam period.

Commonality: All instructors will use the same textbook and cover all topics in the topical outline. A computer lab with mathematical software is provided to facilitate collaboration and the use of technology. A graphing calculator will be required for this course. Either the TI-83 or the TI-84 line of calculators is recommended; any other graphing calculator will need to be approved by the instructor.